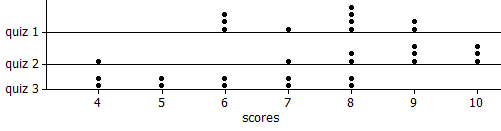
Name Date

1. The scores of three quizzes are shown in the following data plot for a class of 10 students. Each quiz has a maximum possible score of 10. Possible dot plots of the data are shown below.



* 1. On which quiz did students tend to score the lowest? Justify your choice.
  2. Without performing any calculations, which quiz tended to have the most variability in the students’ scores? Justify your choice based on the graphs.
  3. If you were to calculate a measure of variability for Quiz 2, would you recommend using the interquartile range or the standard deviation? Explain your choice.
  4. For Quiz 3, move one dot to a new location so that the modified data set will have a larger standard deviation than before you moved the dot. Be clear which point you decide to move, where you decide to move it, and explain why.
  5. On the axis below, arrange 10 dots, representing integer quiz scores between 0 and 10 so that the standard deviation is the largest possible value that it may have. You may use the same quiz score values more than once.



Use the following definitions to answer questions (f) - (h).

* The *midrange* of a data set is defined to be the average of the minimum and maximum values:   
  (*min* + *max*)/2.
* The *midhinge* of a data set is defined to be the average of the first quartile (*Q*1) and the third quartile (*Q*3): (*Q*1+*Q*3)/2.
  1. Is the midrange a measure of center or a measure of spread? Explain.
  2. Is the midhinge a measure of center or a measure of spread? Explain.
  3. Suppose the lowest score for Quiz 2 was changed from 4 to 2, and the midrange and midhinge are recomputed, which will change more?
     1. Midrange
     2. Midhinge
     3. They will change the same amount.
     4. Cannot be determined

1. The box plots below display the distributions of maximum speed for 145 roller coasters in the United States, separated by whether they are wooden coasters or steel coasters.



Based on the box plots, answer the following questions or indicate whether you do not have enough information.

* 1. Which type of coaster has more observations?

1. Wooden
2. Steel
3. About the same
4. Cannot be determined

Explain your choice:

* 1. Which type of coaster has a higher percentage of coasters that go faster than 60 mph?

1. Wooden
2. Steel
3. About the same
4. Cannot be determined

Explain your choice:

* 1. Which type of coaster has a higher percentage of coasters that go faster than 50 mph?

1. Wooden
2. Steel
3. About the same
4. Cannot be determined

Explain your choice:

* 1. Which type of coaster has a higher percentage of coasters that go faster than 48 mph?

1. Wooden
2. Steel
3. About the same
4. Cannot be determined

Explain your choice:

* 1. Write 2–3 sentences comparing the two types of coasters with respect to which type of coaster normally goes faster.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| A Progression Toward Mastery | | | | | |
| Assessment  Task Item | | STEP 1  Missing or incorrect answer and little evidence of reasoning or application of mathematics to solve the problem | STEP 2  Missing or incorrect answer but evidence of some reasoning or application of mathematics to solve the problem | STEP 3  A correct answer with some evidence of reasoning or application of mathematics to solve the problem, or an incorrect answer with substantial evidence of solid reasoning or application of mathematics to solve the problem | STEP 4  A correct answer supported by substantial evidence of solid reasoning or application of mathematics to solve the problem |
| **1** | **a**  S-ID.2 | Student fails to address the tendency for lower scores. | Student picks quiz 2 because of the low outlier at 4 points rather than focusing on the overall distribution. | Student chooses quiz 3 but does not give a full explanation for their choice. | Student uses an appropriate measure of center (e.g., mean or median) to explain their choice of quiz 3 as the quiz students tended to score the lowest on. |
| **b**  S-ID.3 | Student fails to address the idea of spread or variability or clustering. | Student picks quiz 1 because the heights of the stacks are most irregular. | Student picks quiz 3 but does not give a full explanation for their choice or picks quiz 2 based on one score (the low outlier) as opposed to the overall tendency. | Student chooses quiz 3 and uses an appropriate justification such as stating that the data ranges from 4 to 8. |
| **c**  S-ID.2 | Student does not make a clear choice between SD and IQR. | Student does not justify choice based on shape of distribution or on presence of outlier. | Student considers the distribution symmetric and chooses the standard deviation. | Student chooses the IQR in an attempt to reduce the impact of the one extreme observation. |
| **d**  S-ID.2 | Student does not clearly explain how dot will be moved. | Student adds a dot near the center of the distribution (e.g., 5-7) or student moves a dot toward the center of the distribution. | Student’s dot is moved to change the heights of the stacks of the dots. | Student’s dot is moved to be further from the mean of the distribution (without much change in the mean of the distribution). |
| **e**  S-ID.2 | Student’s placement of dots does not appear to focus on spreading the values as far apart as possible. | Student focuses on having as many different values as possible or on having as much change in the heights to the stacks as possible. | Student spreads the dots out as far as possible without using repeat values (with justification) or does not split the dots into two equal pieces at the two extremes. | Student places half the dots at zero and half the dots at ten. |
| **f**  S-ID.2 | Student selects measure of spread with a weaker explanation. | Student selects measure of spread because of the use of the max and min values. | Student selects measure of center but does not fully explain reasoning. | Student selects measure of center and discusses how the value will correspond to a “middle” number. |
| **g**  S-ID.2 | Student selects measure of spread with a weaker explanation. | Student selects measure of spread because of the use of the quartile values. | Student selects measure of center but does not fully explain reasoning. | Student selects measure of center and discusses how the value will correspond to a “middle” number. |
| **h**  S-ID.2 | Student fails to address the question. | Student selects midrange. | Student selects midrange but does not give a clear explanation. | Student selects midrange and discusses lack of impact on calculation of extreme values. |
| **2** | **a**  S-ID.1 | A or C. | N/A | B. Student often thinks the longer boxplot indicates more observations. | D. The quartiles tell us about percentages not about counts. |
| **b**  S-ID.1 | A, C or D. | N/A | Student selects B but justifies based on the steel coasters having a longer box to the right of 60. | B. Student compares the median of steel (50% above) to upper quartile of wooden (only 25% above). |
| **c**  S-ID.1 | A or D. | N/A | Student selects B and justifies based on the steel coasters having a longer box to the right of 50. | C. Student cites the similarity of the two lower quartiles. |
| **d**  S-ID.1 | A or C. | N/A | B. Student justification focuses on the length of the whisker. | D. Does not clearly correspond to one of the quartiles. |
| **e**  S-ID.1 | Student does not address which type of coaster goes faster. | Student makes a weak comparison without clear justification or context or student focuses on the one steel coaster at 120 mph. | Student describes shape, center, and spread, but does not focus in on center or fails to give some numerical justification with the description of center. | Student describes the center of the distribution and gives some numerical evidence (e.g., median, Q3). |

